

CONDENSERS AND COOLING TOWERS

precautions it is practically impossible to prevent some leakage of air when the condenser is in operation. Another method of testing for air leakage is to run the air-pumps to obtain a vacuum in the condenser, and after stopping these pumps note the fall of vacuum occurring. If the system is reasonably tight, the vacuum should not fall more than a small fraction of an inch of mercury in, say, twenty or thirty minutes. It is sometimes found that the leakage of air into the condenser increases gradually in course of time, with a consequent reduction of the vacuum unless the air-pumps are of ample capacity. On occasion a joint may give way somewhat suddenly and allow quite an abnormal air leakage. Under the pressure of ordinary working conditions the engineer in charge may not notice or may not recognize

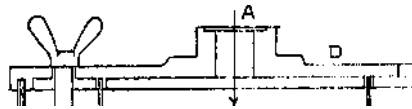


Fig. 12.—Weigh-ton Air Indicator

that these leakages are occurring, and may be ascribing the faulty vacuum to other incidental circumstances.

In order to indicate leakage of air, Professor Veigh-ton has designed an ingenious air indicator, one form of which is illustrated in fig. 12. Instead of allowing the air to be discharged to the atmosphere by the air-pumps, connection is made to the indicator at A so that the air is delivered

inside the
vessel or
bell B, and
therefore it
depresses
the water-level
sufficiently to
allow the air to
escape to the
atmosphere
through the
water in
the annular
space. For this
purpose a large
number of small

holes are bored in the vessel B, and the amount of
air discharged is recog-
nized by the number of holes from which air is
being liberated through
the water. The outer casing c being of glass,
any abnormal leakage is
easily seen, and the cause then sought for.

An increase in the velocity of the water
through the condenser tubes
increases the rate of heat transmission between
the steam and the water,
and, within limits, tends to improve the
vacuum. An increased velocity
of flow, however, causes an increase in the
power required for pumping
the circulating water, and so far as the resistance
of the tubes is concerned
this resistance varies nearly as the velocity
squared. Land practice seems
to have settled down to a velocity of from 5 to 7
ft. per second for high
vacua condensers, and with clean tubes and
normal conditions of working
the rate of heat transmission from the steam to
the water may be taken to
be about 600 to 700 B.Th.U. per hour, per square
foot of outside tube surface,
per degree Fahrenheit difference between the
steam and the water. At